

1 1. An isolated DNA comprising:
2 (a) a nucleic acid sequence that encodes a polypeptide with the ability to co-
3 stimulate a T cell, wherein the nucleic acid sequence hybridizes under stringent conditions to
4 the complement of a sequence that encodes a polypeptide with an amino acid sequence with
5 SEQ ID NO:1 or SEQ ID NO:3; or
6 (b) the complement of the nucleic acid sequence.

1 2. The DNA of claim 1, wherein the nucleic acid sequence encodes a
2 polypeptide comprising an amino acid sequence with SEQ ID NO:1.

1 3. The DNA of claim 1, wherein the nucleic acid sequence encodes a
2 polypeptide comprising an amino acid sequence with SEQ ID NO:3.

1 4. The DNA of claim 1, wherein the nucleic acid sequence has a sequence of
2 SEQ ID NO:2.

1 5. The DNA of claim 1, wherein the nucleic acid sequence has a sequence of
2 SEQ ID NO:4.

1 6. An isolated polypeptide encoded by the DNA of claim 1.

1 7. The isolated polypeptide of claim 6, wherein the polypeptide comprises an
2 amino acid sequence of amino acid residue 23 to amino acid residue 290 of SEQ ID NO:1, or
3 said amino acid sequence but differing solely by conservative substitutions.

1 8. The isolated polypeptide of claim 6, wherein the polypeptide comprises an
2 amino acid sequence of amino acid residue 23 to amino acid residue 290 of SEQ ID NO:3, or
3 said amino acid sequence but differing solely by conservative substitutions.

1 9. The isolated polypeptide of claim 6, wherein the polypeptide comprises an
2 amino acid sequence of SEQ ID NO:1, or said amino acid sequence but differing solely by
3 conservative substitutions.

1 10. The isolated polypeptide of claim 6, wherein the polypeptide comprises an
2 amino acid sequence of SEQ ID NO:3, or said amino acid sequence but differing solely by
3 conservative substitutions.

1 11. A vector comprising the DNA of claim 1.

1 12. The vector of claim 11, wherein the nucleic acid sequence is operably linked
2 to a regulatory element which allows expression of said nucleic acid sequence in a cell.

1 13. A cell comprising the vector of claim 11.

1 14. A method of co-stimulating a T cell, the method comprising contacting the T
2 cell with the polypeptide of claim 6.

1 15. The method of claim 14, wherein the contacting comprises culturing the
2 polypeptide with the T cell *in vitro*.

1 16. The method of claim 14, wherein the T cell is in a mammal.

1 17. The method of claim 16, wherein the contacting comprises administering the
2 polypeptide to the mammal.

1 18. The method of claim 16, wherein the contacting comprises administering a
2 nucleic acid encoding the polypeptide to the mammal.

1 19. The method of claim 16, comprising:

2 (a) providing a recombinant cell which is the progeny of a cell obtained from the
3 mammal and has been transfected or transformed *ex vivo* with a nucleic acid encoding the
4 polypeptide so that the cell expresses the polypeptide; and

5 (b) administering the cell to the mammal.

1 20. The method of claim 19, wherein the cell is an antigen presenting cell (APC)
2 and the cell expresses the polypeptide on its surface.

1 21. The method of claim 20, wherein, prior to the administering, the APC is
2 pulsed with an antigen or an antigenic peptide.

1 22. The method of claim 16, wherein the mammal is suspected of having an
2 immunodeficiency disease.

1 23. The method of claim 16, wherein the mammal is suspected of having an
2 inflammatory condition.

1 24. The method of claim 16, wherein the mammal is suspected of having an
2 autoimmune disease.

1 25. A method of identifying a compound that inhibits an immune response, the
2 method comprising:

- 3 (a) providing a test compound;
- 4 (b) culturing, together, the compound, the polypeptide of claim 6, a T cell, and a
5 T cell activating stimulus; and
- 6 (c) determining whether the test compound inhibits the response of the T cell to
7 the stimulus, as an indication that the test compound inhibits an immune response.

1 26. The method of claim 25, wherein the stimulus is an antibody that binds to a T
2 cell receptor or a CD3 polypeptide.

1 27. The method of claim 25, wherein the stimulus is an alloantigen or an antigenic
2 peptide bound to a major histocompatibility complex (MHC) molecule on the surface of an
3 antigen presenting cell (APC).

1 28. The method of claim 27, wherein the APC is transfected or transformed with a
2 nucleic acid encoding the polypeptide and the polypeptide is expressed on the surface of the
3 APC.

1 29. A method of identifying a compound that enhances an immune response, the
2 method comprising:

- 3 (a) providing a test compound;
- 4 (b) culturing, together, the compound, the polypeptide of claim 6, a T cell, and a
5 T cell activating stimulus; and
- 6 (c) determining whether the test compound enhances the response of the T cell to
7 the antigen, as an indication that the test compound enhances an immune response.

1 30. The method of claim 29, wherein the stimulus is an antibody that binds to a T
2 cell receptor or a CD3 polypeptide.

1 31. The method of claim 29, wherein the stimulus is an alloantigen or an antigenic
2 peptide bound to a MHC molecule on the surface of an APC.

1 32. The method of claim 31, wherein the APC is transfected or transformed with a
2 nucleic acid encoding the polypeptide and the polypeptide is expressed on the surface of the
3 APC.

1 33. An antibody that binds specifically to the polypeptide of claim 6.

1 34. The antibody of claim 33, wherein the antibody is a monoclonal antibody.

1 35. The antibody of claim 33, wherein the antibody binds to the polypeptide with
2 SEQ ID NO:1.

1 36. A cell comprising the vector of claim 12.

1 37. A method of producing a polypeptide that co-stimulates a T cell, the method
2 comprising culturing the cell of claim 36 and purifying the polypeptide from the culture.

1 38. A fusion protein comprising a first domain joined to at least one additional
2 domain, wherein the first domain comprises a polypeptide of claim 6.

1 39. The fusion protein of claim 38, wherein the at least one additional domain
2 comprises the constant region of an immunoglobulin heavy chain or a fragment thereof.

1 40. A nucleic acid molecule encoding the fusion protein of claim 39.

1 41. A vector comprising the nucleic acid molecule of claim 40.

1 42. The vector of claim 41, wherein the nucleic acid molecule is operably linked
2 to a regulatory element which allows expression of the nucleic acid molecule in a cell.

1 43. A cell comprising the vector of claim 42.

1 44. A method of producing a fusion protein, the method comprising culturing the
2 cell of claim 43 and purifying the fusion protein from the culture.

1 45. The method of claim 14, wherein, the T cell is a helper T cell.

1 46. The method of claim 45, wherein the helper T cell is a helper T cell that
2 provides helper activity for a B cell antibody-producing response.

1 47. The method of claim 45, wherein the B cell antibody response is an IgG2a
2 antibody response.

1 48. The method of claim 14, wherein the co-stimulation causes an increase in the
2 level of CD40 ligand on the T cell surface.

AdA
B5
2
C4